

Figure S1 TEM images of MPA-modified CdTe QDs and its corresponding size distribution for 2.2 nm (a,b) and 3.5 nm (c,d).

Abbreviations: TEM, transmission electron microscopy; MPA, 3-mercaptopropionic acid; QDs, quantum dots.

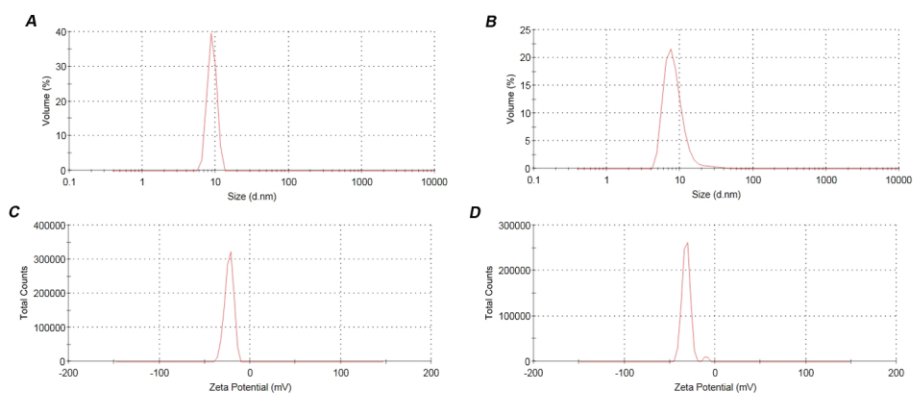


Figure S2 Dynamic light scattering (A and B) and ζ -potential measurements (C and D) of 3.5 nm and 2.2 nm MPA-modified CdTe QDs. DLS values are the average of at least 10 runs each containing 15 submeasurements. ζ -potential values are the average of at least 10 runs each containing 30 submeasurements.

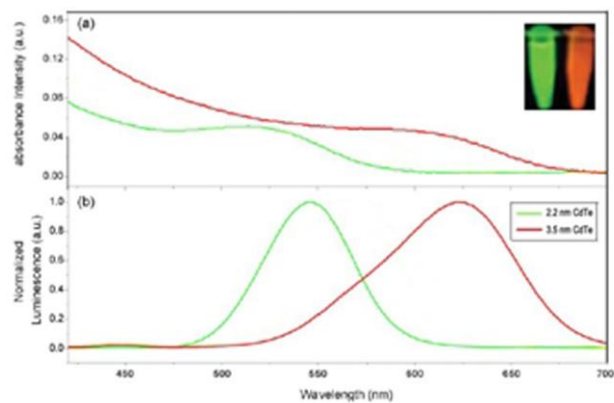
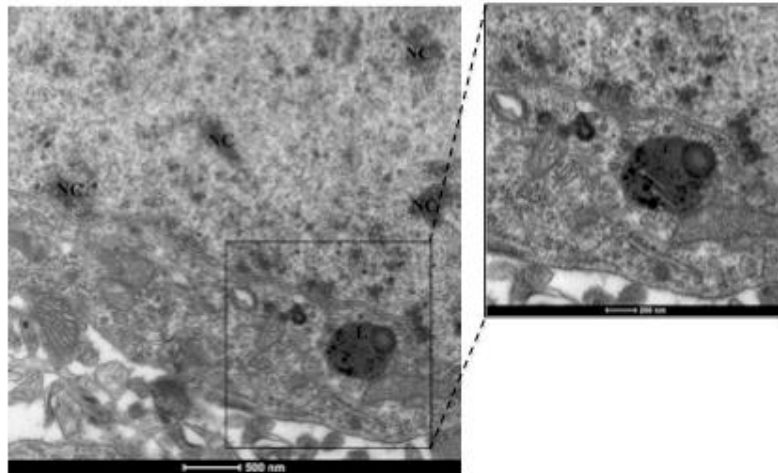


Figure S3 UV-vis absorption (a) and PL spectra (b) of MPA-modified CdTe QDs (2.2 nm and 3.5 nm). The inset shows the fluorescent photograph of as-synthesized CdTe QDs under UV irradiation.

1600 $\mu\text{g}/\text{mL}$
2.2 nm CdTe QD



1600 $\mu\text{g}/\text{mL}$
3.5 nm CdTe QD

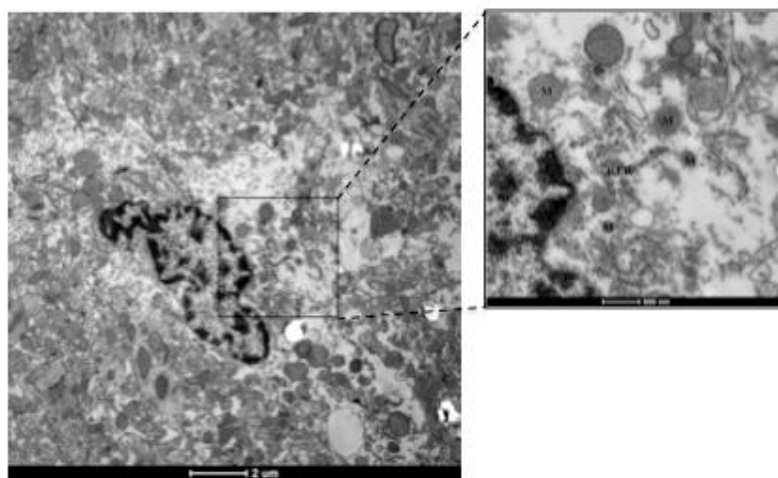


Figure S4. The uptake of MPA-modified CdTe QDs by the hippocampal neurons of treated rats. The arrow indicates accumulated QDs in the lysosome.

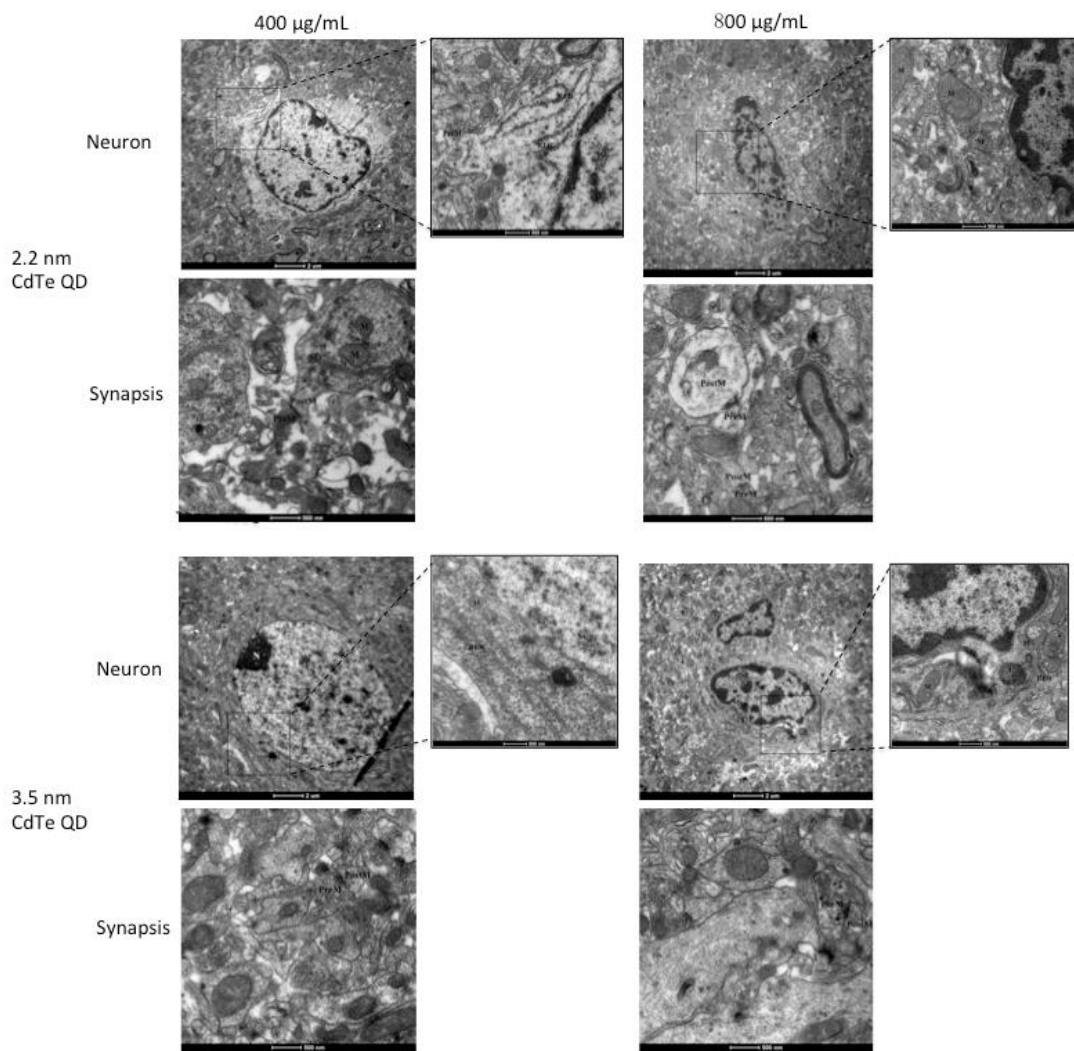


Figure S5. TEM images of hippocampus of rats treated with 400 µg/mL and 800 µg/mL 2.2 nm and 3.5 nm MPA-modified CdTe QDs.

Table S1. All GO terms of genes differentially expressed during 2.2 nm and 3.5 nm MPA-modified CdTe QD exposure on rat hippocampus.

Category	Term	No. of gene	Count(%)	Fold Enrichment	Bonferroni corrected Pvalue
2.2 nm CdTe QD vs. Control					
Biological Process	immune response	10	25	10.07	7.78E-05
Biological Process	response to virus	5	12.5	45.32	1.19E-03
Cellular Component	integrin complex	3	7.5	80.82	1.64E-02
3.5 nm CdTe QD vs. Control					
Biological Process	immune response	107	15.20	6.69	8.33E-56
Biological Process	defense response	83	11.79	5.39	3.10E-34
Biological Process	response to organic substance	73	10.37	2.04	1.69E-05
Biological Process	response to wounding	71	10.09	4.34	1.44E-22
Biological Process	regulation of cell proliferation	58	8.24	2.26	2.55E-05
Biological Process	positive regulation of immune system process	57	8.10	6.36	4.12E-26
Biological Process	regulation of programmed cell death	55	7.81	2.08	1.07E-03
Biological Process	regulation of cell death	55	7.81	2.07	1.22E-03
Biological Process	regulation of apoptosis	54	7.67	2.07	1.65E-03
Biological Process	inflammatory response	51	7.24	6.09	5.10E-22
Biological Process	positive regulation of response to stimulus	51	7.24	5.69	1.30E-20
Biological Process	cell activation	50	7.10	5.35	6.86E-19
Biological Process	leukocyte activation	43	6.11	5.23	2.18E-15
Biological Process	positive regulation of molecular function	42	5.97	2.14	1.51E-02

Biological Process	positive regulation of immune response	40	5.68	7.35	9.80E-20
Biological Process	positive regulation of cell proliferation	39	5.54	2.60	3.18E-04
Biological Process	response to bacterium	36	5.11	4.40	6.14E-10
Biological Process	immune effector process	35	4.97	7.49	3.80E-17
Biological Process	regulation of cell activation	35	4.97	5.39	2.47E-12
Biological Process	regulation of leukocyte activation	33	4.69	5.31	3.18E-11
Biological Process	positive regulation of developmental process	31	4.40	2.58	9.69E-03
Biological Process	positive regulation of cell communication	30	4.26	2.43	4.63E-02
Biological Process	innate immune response	29	4.12	8.83	8.78E-16
Biological Process	lymphocyte activation	29	4.12	4.47	1.31E-07
Biological Process	locomotory behavior	29	4.12	3.61	2.00E-05
Biological Process	hemopoietic or lymphoid organ development	29	4.12	3.00	1.07E-03
Biological Process	immune system development	29	4.12	2.87	2.78E-03
Biological Process	positive regulation of signal transduction	28	3.98	2.54	4.10E-02
Biological Process	taxis	27	3.84	8.42	6.94E-14
Biological Process	chemotaxis	27	3.84	8.42	6.94E-14
Biological Process	activation of immune response	27	3.84	7.77	6.18E-13
Biological Process	positive regulation of cell activation	27	3.84	6.36	1.41E-10
Biological Process	regulation of lymphocyte activation	27	3.84	4.85	1.03E-07
Biological Process	hemopoiesis	27	3.84	3.09	1.66E-03
Biological Process	response to molecule of bacterial origin	26	3.69	5.26	4.13E-08
Biological Process	regulation of protein kinase cascade	26	3.69	2.76	2.22E-02

Biological Process	positive regulation of multicellular organismal process	26	3.69	2.70	3.16E-02
Biological Process	positive regulation of cell differentiation	26	3.69	2.67	3.87E-02
Biological Process	leukocyte mediated immunity	25	3.55	8.63	6.18E-13
Biological Process	positive regulation of leukocyte activation	25	3.55	6.11	3.70E-09
Biological Process	regulation of cytokine production	25	3.55	4.18	1.50E-05
Biological Process	regulation of response to external stimulus	25	3.55	4.02	3.23E-05
Biological Process	regulation of immune effector process	24	3.41	5.70	5.17E-08
Biological Process	response to lipopolysaccharide	24	3.41	5.31	2.38E-07
Biological Process	adaptive immune response	23	3.27	9.02	4.94E-12
Biological Process	adaptive immune response based on somatic recombination of immune receptors built from immunoglobulin superfamily domains	23	3.27	9.02	4.94E-12
Biological Process	regulation of T cell activation	23	3.27	5.32	6.25E-07
Biological Process	wound healing	23	3.27	3.42	2.50E-03
Biological Process	antigen processing and presentation	22	3.13	6.86	9.60E-09
Biological Process	positive regulation of lymphocyte activation	22	3.13	5.87	2.37E-07
Biological Process	T cell activation	22	3.13	5.09	3.96E-06
Biological Process	positive regulation of protein kinase cascade	21	2.98	3.20	2.35E-02
Biological Process	lymphocyte mediated immunity	20	2.84	8.49	1.74E-09
Biological Process	aging	20	2.84	3.45	1.34E-02
Biological Process	myeloid leukocyte activation	19	2.70	9.28	1.31E-09

Biological Process	acute inflammatory response	19	2.70	5.47	2.05E-05
Biological Process	immune response-activating signal transduction	18	2.56	8.47	3.35E-08
Biological Process	leukocyte migration	18	2.56	8.18	6.39E-08
Biological Process	immune response-regulating signal transduction	18	2.56	7.77	1.59E-07
Biological Process	antigen processing and presentation of peptide antigen	17	2.41	11.29	8.51E-10
Biological Process	positive regulation of defense response	17	2.41	6.57	9.35E-06
Biological Process	positive regulation of T cell activation	17	2.41	6.03	3.54E-05
Biological Process	regulation of leukocyte mediated immunity	17	2.41	5.95	4.36E-05
Biological Process	positive regulation of cytokine production	17	2.41	5.87	5.35E-05
Biological Process	cell chemotaxis	16	2.27	10.36	2.27E-08
Biological Process	regulation of lymphocyte proliferation	16	2.27	4.71	3.25E-03
Biological Process	regulation of mononuclear cell proliferation	16	2.27	4.65	3.77E-03
Biological Process	regulation of leukocyte proliferation	16	2.27	4.55	5.04E-03
Biological Process	leukocyte chemotaxis	15	2.13	10.50	9.89E-08
Biological Process	cell activation during immune response	15	2.13	9.03	1.03E-06
Biological Process	leukocyte activation during immune response	15	2.13	9.03	1.03E-06
Biological Process	immunoglobulin mediated immune response	15	2.13	8.09	5.29E-06
Biological Process	cytokine production	15	2.13	7.93	7.15E-06
Biological Process	B cell mediated immunity	15	2.13	7.77	9.58E-06
Biological Process	regulation of innate immune response	15	2.13	7.62	1.27E-05
Biological Process	negative regulation of immune system process	15	2.13	4.62	9.70E-03

Biological Process	defense response to bacterium	15	2.13	4.18	3.26E-02
Biological Process	response to virus	14	1.99	7.88	3.10E-05
Biological Process	regulation of adaptive immune response	14	1.99	5.75	1.75E-03
Biological Process	regulation of adaptive immune response based on somatic recombination of immune receptors built from immunoglobulin superfamily domains	14	1.99	5.75	1.75E-03
Biological Process	immune response-activating cell surface receptor signaling pathway	13	1.85	8.01	1.00E-04
Biological Process	immune response-regulating cell surface receptor signaling pathway	13	1.85	7.32	3.06E-04
Biological Process	positive regulation of immune effector process	13	1.85	6.60	1.05E-03
Biological Process	regulation of lymphocyte mediated immunity	13	1.85	5.18	1.61E-02
Biological Process	regulation of lymphocyte differentiation	12	1.70	5.45	2.52E-02
Biological Process	positive regulation of lymphocyte proliferation	12	1.70	5.27	3.54E-02
Biological Process	positive regulation of mononuclear cell proliferation	12	1.70	5.18	4.18E-02
Biological Process	antigen processing and presentation of exogenous peptide antigen	11	1.56	14.24	2.39E-06
Biological Process	antigen processing and presentation of exogenous antigen	11	1.56	11.39	3.55E-05
Biological Process	positive regulation of lymphocyte differentiation	11	1.56	7.91	1.88E-03
Biological Process	leukocyte proliferation	11	1.56	6.62	1.11E-02
Biological Process	mononuclear cell proliferation	11	1.56	6.62	1.11E-02
Biological Process	neutrophil chemotaxis	10	1.42	11.26	2.44E-04

Biological Process	myeloid cell activation during immune response	10	1.42	9.96	8.40E-04
Biological Process	positive regulation of T cell differentiation	10	1.42	7.62	1.07E-02
Biological Process	antigen receptor-mediated signaling pathway	10	1.42	7.40	1.38E-02
Biological Process	positive regulation of innate immune response	10	1.42	6.81	2.86E-02
Biological Process	positive regulation of adaptive immune response	10	1.42	6.64	3.58E-02
Biological Process	positive regulation of adaptive immune response based on somatic recombination of immune receptors built from immunoglobulin superfamily domains	10	1.42	6.64	3.58E-02
Biological Process	antigen processing and presentation of exogenous peptide antigen via MHC class II	9	1.28	16.65	3.12E-05
Biological Process	antigen processing and presentation of peptide antigen via MHC class II	9	1.28	16.65	3.12E-05
Biological Process	antigen processing and presentation of peptide or polysaccharide antigen via MHC class II	9	1.28	14.56	1.25E-04
Biological Process	T cell proliferation	9	1.28	7.77	3.46E-02
Biological Process	regulation of acute inflammatory response	9	1.28	7.52	4.49E-02
Biological Process	leukocyte adhesion	8	1.14	9.01	4.69E-02
Biological Process	B cell receptor signaling pathway	7	0.99	13.94	1.19E-02
Biological Process	positive regulation of tumor necrosis factor production	7	0.99	13.94	1.19E-02
Cellular Component	plasma membrane	160	22.73	1.71	3.40E-11
Cellular Component	extracellular region	99	14.06	1.98	5.15E-09
Cellular Component	plasma membrane part	91	12.93	1.72	5.57E-05

Cellular Component	extracellular region part	63	8.95	2.33	1.43E-07
Cellular Component	extracellular space	48	6.82	2.50	3.06E-06
Cellular Component	cell surface	39	5.54	2.94	1.20E-06
Cellular Component	external side of plasma membrane	27	3.84	4.14	4.27E-07
Cellular Component	vacuole	26	3.69	3.38	5.82E-05
Cellular Component	lysosome	25	3.55	3.95	5.10E-06
Cellular Component	lytic vacuole	25	3.55	3.95	5.10E-06
Cellular Component	receptor complex	15	2.13	3.66	1.74E-02
Cellular Component	vesicle lumen	11	1.56	5.87	4.08E-03
Cellular Component	platelet alpha granule	11	1.56	5.31	1.02E-02
Cellular Component	MHC protein complex	11	1.56	5.21	1.21E-02
Cellular Component	platelet alpha granule lumen	10	1.42	6.40	5.76E-03
Cellular Component	cytoplasmic membrane-bounded vesicle lumen	10	1.42	5.95	1.07E-02
Cellular Component	T cell receptor complex	6	0.85	13.96	1.08E-02
Cellular Component	alpha-beta T cell receptor complex	5	0.71	21.33	1.04E-02
Molecular Function	protein dimerization activity	42	5.97	2.11	5.13E-03
Molecular Function	carbohydrate binding	34	4.83	2.68	3.00E-04
Molecular Function	cytokine binding	21	2.98	6.42	3.19E-08
Molecular Function	cytokine activity	19	2.70	4.59	8.69E-05
Molecular Function	polysaccharide binding	17	2.41	3.90	4.42E-03
Molecular Function	pattern binding	17	2.41	3.90	4.42E-03
Molecular Function	glycosaminoglycan binding	16	2.27	4.17	3.86E-03

Molecular Function	chemokine activity	14	1.99	11.63	3.04E-08
Molecular Function	chemokine receptor binding	14	1.99	11.28	4.84E-08
Molecular Function	heparin binding	13	1.85	4.80	9.05E-03

Table S2. The rest of differentially expressed pathways in the control with 3.5 nm MPA-modified CdTe QD-treatment.

Term	Pathway ID	Input number of gene	Background number of gene	Corrected P-Value
Chemokine signaling pathway	rno04062	31	155	0.000224868
Legionellosis	rno05134	16	50	0.000245244
Hematopoietic cell lineage	rno04640	20	76	0.000245244
Phagosome	rno04145	31	158	0.000245244
Herpes simplex infection	rno05168	33	176	0.00027901
Viral myocarditis	rno05416	19	72	0.000307548
Rheumatoid arthritis	rno05323	20	79	0.000307548
NOD-like receptor signaling pathway	rno04621	16	54	0.0003588
Primary immunodeficiency	rno05340	13	36	0.0003588
Graft-versus-host disease	rno05332	15	48	0.0003588
Complement and coagulation cascades	rno04610	17	62	0.000426855
NF-kappa B signaling pathway	rno04064	20	83	0.000432465
Influenza A	rno05164	28	151	0.000885282
Type I diabetes mellitus	rno04940	15	57	0.001523512
Allograft rejection	rno05330	14	52	0.001953369
Natural killer cell mediated cytotoxicity	rno04650	18	81	0.002039337
HTLV-I infection	rno05166	38	250	0.002039337
Autoimmune thyroid disease	rno05320	14	56	0.00331383
TNF signaling pathway	rno04668	19	98	0.005508827
Cytosolic DNA-sensing pathway	rno04623	12	46	0.00566281
Malaria	rno05144	12	47	0.006431329
Salmonella infection	rno05132	15	72	0.009330565
Fc gamma R-mediated phagocytosis	rno04666	15	76	0.014354617
Inflammatory bowel disease (IBD)	rno05321	12	54	0.016114137
Leukocyte transendothelial migration	rno04670	18	103	0.017024126
Measles	rno05162	19	116	0.024163724
T cell receptor signaling pathway	rno04660	17	99	0.024288879
B cell receptor signaling pathway	rno04662	13	67	0.026966697
Epstein-Barr virus infection	rno05169	26	191	0.044440886

Intestinal immune network for IgA production	rno04672	9	41	0.048359461
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